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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/017,855	12/14/2001	Philip A. Fisher	039153-0441 (GO406)	9701

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EXAMINER

MALDONADO, JULIO J

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 12/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/017,855

Applicant(s)

FISHER ET AL.

Examiner

Julio J. Maldonado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 21-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 09/11/2003 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1-14 and 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Auda et al. (U.S. 5,139,904) in view of Tsai et al. (U.S. 6,183,937 B1).

In reference to claims 1, 4, 7, 8, 11 and 21, Auda et al. (Figs.2A-2D) in a related patterning process teach patterning a transistor gate pattern (17a) on a photoresist layer (17); curing the transistor gate pattern (17a); trimming the cured transistor gate pattern (17a); and transferring the trimmed transistor gate pattern (17a') to a layer (16) disposed below said trimmed pattern (17a') to form a transistor gate (16a) (column 5, line 30 – column 6, line 17).

However, Auda et al. fail to teach curing the transistor gate pattern with an electron beam, wherein the transistor gate pattern includes a width and a length, and a variation of the width along the length of the transistor gate is reduced due to the curing step. However, Tsai et al. (Figs.5-9) in a related method to pattern a transistor gate teach depositing a photoresist layer (38) on a layer (38) used to form the gate electrode; patterning a transistor gate pattern (38a) on a photoresist layer (38); curing the transistor gate pattern (38a) with an electron beam, wherein the transistor gate pattern includes a width and a length, and a variation of the width along the length of the

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transistor gate is reduced due to the curing step (column 8, line 6 – column 11, line 46). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to cure the gate pattern as taught by Tsai et al. in the patterning process of Auda et al., since this curing process decompose a conformal surface layer of the patterned photoresist layer while simultaneously forming a patterned photoresist layer having a second linewidth narrower than the first linewidth (column 3, lines 44 – 49).

The combined teachings of Auda et al. and Tsai et al. substantially teach all aspects of the invention but fail to show wherein the final gate transistor width is in the range of approximately 20-60 nm, and wherein the uniformity of the gate width is 4 to 6 nm over 3 nm segment. Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert.

denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

In reference to claims 2, 3, 14, 25 and 26, the combined teachings of Auda et al. and Tsai et al. teach wherein the photoresist layer is comprised of a photoresist material used for of 248 lithography and is commercially available (Tsai et al., column 6, lines 26 – 46).

In reference to claims 5, 6, 9, 10 and 22, the combined teachings of Auda et al. and Tsai et al. substantially teach all aspects of the invention but fail to expressly teach wherein the curing step includes exposing the transistor gate pattern to the electron beam having a dose in the range of approximately 100-100,000 $\mu\text{C}/\text{cm}^2$; and wherein the curing step includes exposing the transistor gate pattern to the electron beam having an accelerating voltage in the range of approximately 5-50,000 Volts. However, since the operating parameters of the curing step are performed in the same wavelength obtaining the same result (reduction in linewidth), it would have been obvious to one of ordinary skill in the art at the time the invention was made that the electron beam would have a dose in the range of approximately 100-100,000 $\mu\text{C}/\text{cm}^2$ and an accelerating voltage in the range of approximately 50-2,000 Volts.

In reference to claims 7, 13 and 24, the combined teachings of Auda et al. and Tsai et al. teach wherein the curing step includes changing at least one of a vertical etch rate, a horizontal etch rate, and a minimum extension erosion rate associated with the transistor gate (column 8, line 6 – column 11, line 46).

In reference to claims 12 and 23, the combined teachings of Auda et al. and Tsai et al. teach wherein the photoresist layer is comprises of a material selected from a group consisting of a phenolic-based polymer (Tsai et al., column 2, lines 29 – 65).

Response to Arguments

3. Applicant's arguments filed 09/11/2003 have been fully considered but they are not persuasive.

Applicants argue, "... There is no teaching or suggestion in Auda et al. or Tsai et al. that would motivate one of skill in the art to combine their teachings, and therefore a prima facie case of obviousness has not been established with regard to claims 1-14 and 21-26...". In response to this argument, the teachings of Auda et al. and Tsai et al. are directed to the formation of fine patterns either by trim etching (as taught by Auda et al.) or by photoresist decomposition (as taught by Tsai et al.). As established in the prior office action, by including the curing process of Tsai et al. prior to the trim etching of Auda et al. would result in a patterned photoresist layer having a narrower linewidth as taught by Tsai et al., resulting in an even narrow line width pattern in Auda et al. Therefore, there is motivation to combine their teachings and a prima facie case of obviousness exists.

Also, applicants argue, "... There is no teachings or suggestion in Auda et al. to trim a photoresist pattern that has been cured or irradiated with an electron beam...". In response to this argument, Auda et al. teach curing the photoresist layer prior to trim etching said photoresist (Auda et al., column 5, lines 30 – 49). On the other hand, Tsai et al. teach curing a photoresist layer by irradiating with an electron beam (Tsai et al.,

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column 6, lines 26 – 34). Therefore, by using the curing process of Tsai et al. in the patterning process of Auda et al., one of ordinary skill in the art would arrive to the claimed invention. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants also argue that neither Auda et al. nor Tsai et al. teach the operational specifications described in claims 4-6 and 11, for example. In response to this argument, these operational specifications are the result of routine optimization within the art and it is not inventive to discover the optimum or workable ranges by routine experimentation. See MPEP 2144.05.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.


JMR
12/5/03


George Hourson
Primary Examiner